NON-PUBLIC?: N
ACCESSION #: 9005160103
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Sequoyah Nuclear Plant, Unit 2 PAGE: 1 OF 06

DOCKET NUMBER: 05000328

TITLE: Sequoyah Unit 2 reactor trip from general warning alarm on both trains of solid state protection system as a result of performing surveillance test steps out of sequence.
EVENT DATE: 04/10/90 LER #: 90-008-00 REPORT DATE: 05/09/90

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
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Licensing Engineer

COMPONENT FAILURE DESCRIPTION:
CAUSE: SYSTEM: COMPONENT: MANUFACTURER:
REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On April 10, 1990, with Unit 1 defueled and Unit 2 in Mode 1 at 100 percent power, a reactor trip occurred on Unit 2 at 0134 Eastern daylight time. The trip resulted from a general warning alarm on both trains of the solid state protection system (SSPS) and was caused by surveillance test steps being performed out of sequence during a monthly SSPS Train B functional test. When the out-of-sequence situation was discovered, the process used to evaluate the situation was not as specified in plant instructions. As a consequence when the omitted steps were performed out of sequence, a reactor trip occurred. Plant systems responded properly and the shutdown posed no danger to plant employees or the general public. The root cause of the event has been attributed to personnel error on the part of the test director and his supervisor in not following procedures addressing an out-of-sequence situation. As

corrective action, appropriate disciplinary action has been given to both the test director and the supervisor. In addition, a site wide message has been distributed to provide lessons learned from the event and to emphasize the proper response to problems encountered during work.

END OF ABSTRACT

DESCRIPTION OF EVENT

On April 10, 1990, with Unit 1 defueled and Unit 2 in Mode 1 at 100 percent power, 2,232 pounds per square inch gauge (psig), 578 degrees Fahrenheit (F), a reactor trip occurred on Unit 2 at 0134 Eastern daylight time (EDT). The trip resulted from a general warning alarm (EIIS Code ALM) on both trains of the solid state protection system (SSPS) (EIIS Code JC) and was caused by surveillance test steps being performed out of sequence.

The surveillance test being performed was a monthly SSPS Train B functional test using Surveillance Instruction (SI) 90.82, "Reactor Trip Instrumentation Monthly Functional Test (SSPS)." The instrument and control test crew had conducted their pretest briefing at 0015 EDT and had collected the necessary communication equipment. The SI is performed and documented by the test crew at three work locations. Data Sheet 1 is completed in the main control room (MCR) (EIIS Code NA); Data Sheet 2 is completed in the auxiliary instrument room (AIR) (EIIS Code NA); and Data Sheet 3 is completed in the rod control room (EIIS Code NF). This same test crew had recently performed the equivalent SI on Train A of the Unit 2 SSPS, and each person was assigned to perform the same task as before.

The test director (TD) was stationed in the MCR and was responsible for coordination among the three work stations. The TD initiated the SI performance at 0109 EDT and performed the preparatory steps of Data Sheet 1, which include obtaining operator approval to perform the test and installing orange stickers on various status and alarm lights in the MCR designating test status. The TD then read through the next two Data Sheet 1 steps (Steps 3.0 and 4.1) to Step 4.6.1, which had him ensure that the test crew members were at their assigned stations and communications were established. The TD did not take any actions to ensure Steps 3.0 or 4.1 were satisfied at this time. Step 4.1 states that Steps 4.1 through 4.5 (which are on Data Sheet 2) are performed in the AIR to verify lamp bulbs are working, to verify the general warning alarm status of both SSPS trains, and to place the SSPS multiplexer test switch (EIIS Code MPX) in the "normal" position.

When communications between the three work locations had been verified, the TD continued the SI performance at Step 4.6.2. Step 4.1 had still not been performed. At Step 4.6.3, the instrument mechanic in the rod control room tested, racked-in, and closed the Train B bypass reactor trip breaker (EIIS Code AA). This bypass breaker must be in service during performance of the SI to avoid a reactor trip. However, having the bypass breaker in service caused a general warning alarm on SSPS Train B. After the bypass breaker was put in service, the SI performance continued to Step 4.6.5. At this point, it was noted that the test crew in the AIR had not yet performed Steps 4.3 through 4.5. The TD and test performer in the AIR discussed between themselves the fact that the SI steps were out of sequence and came to the conclusion that the test could be caught up without impact on the unit by performing the omitted steps out of sequence. No drawings or manuals were reviewed during this decision making process, nor was the shift operations supervisor (SOS) consulted.

DESCRIPTION OF EVENT (Continued)

The process used by the TD to evaluate the out-of-sequence situation was not as specified by Section 7.9 of Administrative Instruction (AI) 47, "Conduct of Testing." AI-47 requires an out-of-sequence situation to be documented as a test deficiency and requires the proposed corrective action to be reviewed and approved by the responsible supervisor and by the SOS. A review of instruction prerequisites, preceding steps, control logic, and equipment configuration is also required. AI-47 urges the TD to exercise caution and judgement before proceeding and advises the TD to resist the strong tendency to simply skip back and perform the omitted steps. Completion of AI-47 training is a prerequisite for being a TD.

The unit tripped at 0134 EDT when Step 4.4 was performed out of sequence. Step 4.4 directs the performer to turn the SSPS Train A multiplexer test switch to the normal position. This action passes the switch through the "input-error-inhibit" position, which results in a momentary general warning alarm on SSPS Train A that clears when the switch reaches the normal position. When SI-90.82 is performed in the proper sequence, this step is completed before the bypass breaker for Train B is placed in service. During the performance on April 10, 1990, however, when the multiplexer test switch passed through the input-error-inhibit position and caused a momentary Train A general warning alarm with the Train B general warning alarm already in because the bypass breaker had been placed in service, the SSPS functioned as designed and a reactor trip occurred.

After the trip, Operations personnel responded using Emergency Procedures E-0, "Reactor Trip or Safety Injection," and ES-0.1, "Reactor Trip Response," and General Operating Instruction (GOI) 3, "Plant Shutdown From Minimum Load to Cold Shutdown," to stabilize the unit. The plant response during and after the trip is discussed later in this report. Overall, plant systems responded properly, and the shutdown posed no danger to plant employees or the general public.

Limiting Condition for Operation (LCO) 3.7.1.2 (auxiliary feedwater system) was entered at 0235 EDT on April 10, 1990, when the turbine-driven auxiliary feedwater pump (TDAFWP) (EIIS Code BA) steam supply was swapped from steam generator (S/G) (EIIS Code AB) No. 1 to S/G No. 4 because of limit switch problems on the trip and throttle valve position. S/G No. 4 is a qualified TDAFWP steam supply, however, because it cannot automatically swap to an alternate steam supply, the TDAFWP steam supply system was considered inoperable. The limit switch problems were subsequently resolved, and the TDAFWP steam supply was returned to S/G No. 1. LCO 3.7.1.2 was exited at 0255 EDT.

CAUSE OF EVENT

The root cause of the reactor trip has been attributed to a personne

error by the TD and his supervisor (who was acting as one of the test performers in the AIR) in that procedure steps were not followed in sequence, and an inadequate amount of oversight direction was provided after the out-of-sequence situation was discovered. The TD and supervisor acted inappropriately in response to the out-of-sequence situation by not following the guidance of Section 7.9 of AI-47.

ANALYSIS OF EVENT

This event is being reported in accordance with 10 CFR 50.73(a)(2)(iv), as a reactor protection system actuation that was not part of a preplanned sequence. As shown by the following discussion of plant response during and after the trip, plant systems and parameters behaved in a manner consistent with the responses described in the SQN Updated Final Safety Analysis Report (UFSAR). Consequently, it can be concluded that there were no adverse consequences to the health and safety of plant personnel or the general public as a result of this event.

Reactor Coolant System (RCS) Pressure

Before the event, RCS pressure was 2,232 psig. After the trip occurred, the RCS pressure dropped as low as 2,020 psig and rose as high as 2,250 psig before stabilizing at 2,230 psig. These values are comparable to values shown in UFSAR for this type event. Overall, RCS pressure responded as expected.

RCS Temperature

Before the event, RCS average temperature, (Tavg) was 578 degrees F. After the trip, Tavg dropped to 541 degrees F. The operators exercised control in accordance with the guidelines of ES-0.1 and maintained Tavg above 540 degrees F. After the event, Tavg stabilized at 548 degrees F. Because Tavg remained within procedural limits, no emergency boration was required.

Pressurizer Level

Pressurizer level was 60 percent before the trip. During the event, the level decreased to 27 percent as compared to the program level of 26 percent. The level stabilized within limits of the control system and within the bounds of the accident analysis.

Forced/Natural Circulation

All four reactor coolant pumps remained in operation for the duration of the event. Consequently, no UFSAR assumptions were challenged.

Containment Pressure, Temperature and Radiation

No perturbations were observed in containment pressure, temperature or radiation levels. Consequently, no technical specification (TS) requirements or UFSAR assumptions were challenged.

Heatup/Cooldown Limits

TSs limit the RCS cooldown rate to 100 degrees F in any one hour period. Based upon strip chart recorder traces, this cooldown limit was not exceeded during this event. No heatup was experienced during the event.

ANALYSIS OF EVENT (Continued)

Reactor Power

Before the trip, reactor power was being maintained at 100 percent rated thermal power. After the trip, power decreased as expected.

Steam Pressure

Before the trip, S/G pressure varied from 850 to 860 psig. After the trip, S/G pressure increased to slightly over 1,000 psig. Steam pressure stabilized at no-load pressure as RCS Tavg stabilized at 548 degrees F. No TS requirements or UFSAR accident analyses were challenged.

Feedwater Flow

Feedwater flow was steady at 100 percent flow before the trip with all four main feedwater regulator valves in automatic. The main feedwater system responded as expected after the trip. Operators took manual control of the TDAFWP to control the RCS Tavg following the trip. The auxiliary feedwater system operated as designed.

The TDAFWP steam supply was swapped to S/G No. 4 because of limit switch problems on the trip and throttle valve as previously discussed. The limit switch problems were resolved and the steam supply was returned to S/G No. 1 after approximately 20 minutes.

Steam Flow

Before the trip, steam flow was steady at 100 percent flow. Steam flow decreased rapidly following the reactor trip as expected. The steam flow response was bounded by UFSAR accident analyses.

S/G Level

Before the event, levels in all four S/Gs were steady at 44 percent. The S/G levels responded within acceptable limits following the trip.

Shutdown Margin

Before the trip, the reactor was operating with control rods above the minimum insertion limits. Thus, by definition, adequate shutdown margin was available. Following the trip, RCS cooldown occurred as previously described. Adequate shutdown margin was maintained by conformance to ES-0.1 guidelines and by performance of SI-38, "Shutdown Margin," at 0234 EDT. No TS or accident analysis assumptions were violated.

CORRECTIVE ACTION

The immediate action taken by the operators was to stabilize the unit in accordance with the governing instructions. A posttrip review team was assembled and an assessment of the cause of the trip and response of the unit was begun.

Several corrective actions have been implemented as recurrence controls. The TD and supervisor involved have been given the appropriate level of disciplinary action. To provide a lesson learned to all site personnel, a site wide message was issued by the Site Director describing this event and its cause and emphasizing the personal responsibility of each employee for performing his or her work correctly. The message also reiterated the policy on what to do if a mistake is made in performing a task, i.e., work is stopped immediately and any problems are resolved before proceeding.

In addition, as a long-term effort to reduce personnel errors, a Human Performance Enhancement System (HPES) program is being developed at SQN. This aggressive program will use an 11-part seminar developed by the Institute of Nuclear Power Operations from industry experience gained through the evaluation of hundreds of situations involving human performance. These seminars describe the major variables that have been identified as impacting human performance and are designed to provide a better understanding of human performance, and the factors that influence human behavior. The information presented builds on previously acquired technical, academic, and practical knowledge and is expected to result in a reduction of the number of events resulting from human errors.

ADDITIONAL INFORMATION

There have been three previously submitted LERs reporting reactor trips that occurred as the result of personnel error by instrument mechanics during performance of surveillances: SQRO-50-327/87005, 328/85001, and 328/88024. Previous corrective actions have included counselling on the importance of following procedures, review of events for lessons learned, and disciplinary action. TVA believes these actions were appropriate to minimize potential for recurrence. However, recognizing random human oversight/errors cannot be totally eliminated, efforts must always be ongoing to emphasize attention to detail. As described above, TVA is emphasizing and providing additional focus through HPES.

COMMITMENTS

None.

0825h

ATTACHMENT 1 TO 9005160103 PAGE 1 OF 1

TENNESSEE VALLEY AUTHORITY

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May 9, 1990

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Gentlemen:

TENNESSEE VALLEY AUTHORITY - SEQUOYAH NUCLEAR PLANT UNIT 2 - DOCKET NO.
50-328 - FACILITY OPERATING LICENSE DPR-79 - LICENSEE EVENT REPORT (LER)
50-328/90008

The enclosed LER provides details of a reactor trip on Unit 2, which resulted from a general warning on both trains of the solid state protection system, and was caused by surveillance test steps being performed out of sequence. This event is being reported under 10 CFR 50.73(a)(2)(iv).

Very truly yours,

TENNESSEE VALLEY AUTHORITY

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